REMARKS

Claims 1-15 and 17-20 are currently pending in the above-identified application. Claim 1 has been amended to clarify the subject matter regarded as the invention. Support for the amendment is found throughout the specification as filed and, therefore, no new matter is added by these amendments.

Rejections Under 35 U.S.C. §103

Claims 1-2, 9-15, 17, and 19-20 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,975,893 to Chishti et al. (hereinafter "Chishti") in view of Watt et al., Advanced Animation and Rendering Techniques, © 1992, pp. 101-110 (herein after "Watt"), and further in view of Bourke, Paul. "Coordinate System Transformation". June 1996. (herein after "Bourke"), and further in view of Yamany, S.M. and Farag, A.A., "A System for Human Jaw Modeling Using Intra-Oral Images," Proc. Of the 20th Annual Conf. of the IEEE Engineering in Medicine and Biology Society, Vol. 2, pp. 563-566, November 1998 (hereinafter "Yamany"). Applicants respectfully traverse this rejection.

While Applicants respectfully disagree with the rejection and do not acquiesce to any reasoning provided by the Examiner, claim 1 has been amended in order to clarify certain differences between the present invention and the cited references, and to further advance prosecution of the present case. Applicants submit that the cited references would fail to teach or suggest each and every element of the currently claimed invention, thereby precluding *prima facie* obviousness.

As can be understood with reference to the Figures and the originally filed specification for this case, the method of claim 1 provides numerous advantages in computer modeling of a patient's teeth according to the currently disclosed invention. First, creating a parametric representation of the teeth as recited in claim 1 provides improved imaging/computer modeling of a patient's teeth, including improved imaging/modeling of unexposed surfaces or portions of the teeth (e.g., interproximal areas, tooth root, root shapes, etc.) not necessarily visible from the original input mesh data set. See, e.g., paragraphs 0054, 0097 of the published

application. Second, creation of the parametric representation as described actually significantly reduces image file size, thereby effectively providing a sort of compression of the digital data set. See, e.g., paragraphs 0014, 0050, 0065 of the published application. Third, while digital data set size is significantly reduced, the described and claimed methods provide this and other advantages without sacrificing image resolution, thereby providing generation of realistic high-resolution models of a patient's teeth. See, e.g., paragraphs 0017, 0065, Figure 7, of the published application. Thus, the claimed methods at least provides advantages of enhanced image data/information, reduced file size, and allow fast, efficient storage and transmission, and rendering of high-resolution images. Not only do the cited reference fail to provide the significant advantages of the methods of the invention, but the cited references, taken alone or in combination, also fail to teach each and every element of the computer-implemented method of claim 1.

The cited reference of Chishti fails to teach numerous aspects of the claimed invention. Chishti at least fails to teach creating a parametric representation of the teeth from meshes, or creating such a representation that includes the image data (e.g., exposed/unexposed tooth portion image data) as recited in claim 1, and further fails to teach any means reducing file size while preserving image resolution, or transmitting and rendering a high-resolution image of the teeth. In fact, Chishti teaches just the opposite in teaching an embodiment including removal of data to generate a lower resolution image for improving manageability of data transmission. (see, col. 10, lines 51-53 of Chishti). As such, Chishti fails to teach a numerous elements of current claim 1, including a rendered graphical representation having a resolution substantially equivalent to a first resolution, as recited in claim 1.

The newly cited reference to Watt also fails to provide various elements recited in current claim 1, including those elements that are missing from Chishti. Watt merely provides generic teachings regarding surface fitting/rendering techniques, in general, but Watt lacks the specific teachings as described in the current specification, e.g., at paragraphs 0048-0066 of the published application, for practicing the claimed method as recited in claim 1. For example, Watt is silent about application of these generically described techniques in dental/orthodontics or in creating a representation of a patient's teeth, or creating a parametric representation

comprising both exposed and unexposed tooth surface data. With respect to reduction of file size, a review of the reference to Watt was unable to locate any discussion of data compression techniques per se or use of the surface fitting techniques specifically to reduce file size. Thus, Watt, taken alone or in combination with Chishti, would at least fail to teach creating a parametric representation of the teeth that comprises exposed tooth surface image data and unexposed tooth surface image data, and further provides compression of the digital data set, as recited in claim 1.

Even if, for arguments sake only, one of ordinary skill were to attempt to combine the techniques of Watt with the system of Chishti as proposed, the combination of cited references would still lack the specific teachings necessary to produce the currently claimed invention, and would not appear to be a mere exercise of simple mechanics, but even if attempted would actually require additional teachings and/or reconstruction or re-engineering not taught by either reference alone or in combination. Indeed, the cited Watt reference laments the difficulties in fitting parametric surfaces in general (see, e.g., opening paragraph of the reference including stating *inter alia* that "Fitting a parametric surface through an arbitrary set of data points is a difficult problem."). Regardless of whether the proposed combination would be attempted in the first place, as discussed above the cited references taken either alone or in combination would still at least fail to teach each and every element of claim 1.

Bourke fails to provide the teachings that are missing from Chishti and Watt. Bourke includes several equations for converting between Cartesian, cylindrical, and spherical/polar coordinates, but does little to cure the deficiencies of Chishti and Watt. Bourke does not teach creating representations of teeth (or anything in particular) and certain fails to teach generating a parametric representation of teeth from a digital data set of meshes representing the teeth, or numerous elements recited in claim 1.

Yamany adds little, if anything, to the present rejection and certainly fails to cure the deficiencies of Chishti, Watt, and Bourke. Yamany teaches a technique using perspective projection and camera calibration to extract 3D information from a sequence of 2D images of a jaw (see, e.g., abstract of Yamany). Thus, while Fig. 4 and the corresponding description in Yamany refer to generally to "different view angles", a review of Yamany reveals that these

images are registered in a manner that differs distinctly from the currently claimed method. Thus, Yamany would at least fail to teach rendering at the second system a graphical representation of the teeth using the parametric representation, the rendered graphical representation having a resolution substantially equivalent to the first resolution, and wherein the rendering comprises rendering the teeth at a selected one of multiple orthodontic-specific viewing angles, as recited in current claim 1.

Thus, the combined teachings of Chishti, Watt, Bourke, and Yamany fail to teach or suggest each and every element of claim 1, thereby precluding *prima facie* obviousness. Dependent claims 2, 9-15, 17, and 19-20 will be allowable at least for depending from allowable independent claim 1. Further, Applicants do not necessarily agree with the Examiner's characterizations of Applicants previously stated positions regarding compression aspects.

Accordingly, Applicants respectfully request that the rejections of claims 1-2, 9-15, 17, and 19-20 under 35 U.S.C. §103(a) be withdrawn.

Claims 3-8 and 18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Chishti in view of Watt, and further in view of Bourke, and further in view of Yamany and further in view of Official Notice.

The combination of Chishti, Watt, Yamany, and Bourke as applied to claim 1 is overcome for at least the reasons set forth above. The Examiner's Official Notices do not provide the teachings that are missing from the Chishti, Watt, Yamany, and Bourke references. As such, dependent claims 3-8 and 18 should be allowable at least for depending from allowable independent claim 1.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 206-467-9600.

Respectfully submitted,

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